yourYukon Archive of Columns

Columns may be reprinted with permission.
Please contact youryukon@taiga.net.

Column 464

Drought stress changing the Takhini landscape

by Claire Eamer

It's hard to kill an aspen. Ask anyone who has tried to get rid of one from a well-watered urban yard.

Chopping down the tree is easy enough. Alarmingly soon, however, a horde of tiny aspens pops through the ground wherever the original tree's roots extended. Instead of one tree, you now have a small forest.

But drought can kill an aspen, or limit its growth and regeneration, much more effectively than any urban gardener.

Drought has been doing just that along the northern edges of the prairies over the past few years, and it appears to be having the same effect in the southern Yukon.

Edmonton-based researchers Ted Hogg and Ross Wein recently published a paper about Yukon droughts in the Canadian Journal of Forest Research, based on studies in the Takhini valley west of Whitehorse, where the mature mixed-wood forest was wiped out by a severe forest fire in 1958.

Ross Wein examines trees on the Takhini burn west of Whitehorse, where a prairie-like landscape with a sparse cover of aspen has replaced the spruce-dominated forest.

(photo: Ted Hogg)

Before the fire, the Takhini forest was dominated by white spruce. Almost 50 years after the fire, most of the burn area is grassy parkland dotted with scattered spruce and aspen.

2008-02833/

It's the kind of landscape you might expect to find in the warm, dry foothills of Alberta, Hogg says. And it might become more common along the southern edge of the Yukon's boreal forest if climate change, as expected, brings warmer and drier weather to the region.

After examining the growth rings of both aspen and spruce in the burned area and the surrounding unburned area, Hogg and Wein concluded that a good part of the reason for the slow regrowth of the Takhini forest is drought stress.

The tree rings indicate that years of poorest growth in both aspen and spruce were also the years with the lowest precipitation. In the driest years, 1958 and 1998, precipitation was only 60 percent of the long-term normal.

"People tend to think that forest growth is limited by temperature," Hogg says. However, a comparison of the growth patterns with temperature showed a much weaker linkage.

Temperature does play an indirect role. The warmer it is, the more moisture trees lose to the atmosphere, and the more moisture they need to take up from the ground.

Jill Johnstone, a Whitehorse-based forest researcher who has also been studying the regrowth of the Takhini forest, says there's never a lot of moisture to spare in the forests of the southern Yukon, so a dry year is particularly hard on trees.

"The Yukon is actually a poster child for drought effects on forest growth," she says. "The Yukon has some of the driest boreal forest in the world."

In the Takhini valley, Hogg and Wein found that established trees of both main species, spruce and aspen, have been affected by drought years. However, Hogg says that aspen are better at regenerating after drought because they grow from suckers while spruce rely on seeds.

"Regeneration is more of a problem for spruce. It doesn't take much to kill off seedlings."

Drought stress can have a dramatic effect on a forest, Hogg says: "It can change the landscape over a fairly short period of time."

In Saskatchewan, several years of extreme drought have killed off even aspen in some areas, he says.

"In some cases the die-back is so severe it looks like a fire got them, but it's just drought."

Much of the discussion of climate change related to the boreal forest has focused on the northward advance of treeline as the temperature warms, but Hogg thinks there could be an equally noticeable northward movement of the southern boundary, with

aspen parkland taking over from forest in dry areas like the Yukon.

"You'll probably see more of a shift toward aspen if you have a warmer, drier climate. I think it is a major emerging issue."

Johnstone agrees that the southern boreal forest is vulnerable.

"The question here is whether summer warming will be accompanied by a sufficient increase in precipitation."

The trigger will be disturbances like fire and insect infestation, she says. If precipitation doesn't increase, the trees will be more susceptible to disturbance, and new recruits -- whether seedlings or shoots -- might not survive at all.

For more information about how climate change may be affecting the boreal forest, contact Jill Johnstone (Yukon College, Whitehorse), Ted Hogg (Canadian Forest Service, Natural Resources Canada, thogg@nrcan.gc.ca), or Ross Wein (University of Alberta).